

Amendments to the Claims

This listing of claims will replace all prior versions, and listings of claims in the application.

Listing of Claims

Claims 1-10 (canceled)

11. (Currently Amended) A reactor of the staged adiabatic reactor type, comprising:
- (a) adiabatic beds of catalyst each including at least one catalyst and that receive reactants for reaction purposes;
 - (b) at least one printed circuit heat exchange (PCHE) panel interposed between the adiabatic beds of catalyst that receives reactants for heat exchange purposes, wherein a facial area of the heat exchanger panel and a superficial facial area of the catalyst are substantially similar, wherein the heat exchanger panel includes discrete passages for handling reactants and heat transfer media, respectively, and wherein the passages for heat transfer media permit at least two differing flow path directions for the heat transfer media through the heat exchanger panel.
12. (Previously Presented) A reactor according to claim 11, wherein the PCHE panel is comprised of a plurality of plates are superposed and diffusion bonded to form a stack of plates to form the PCHE heat exchange panel, wherein fluid passages are defined in the stack by virtue of a pre-treatment of the plates, and wherein each plate is selectively configured to provide either channeled surfaces or blank surfaces in order to obtain a desired pattern of fluid passages in the heat exchanger.

13. (Previously Presented) A reactor according to claim 12, wherein channels are formed by removal of surface material from the plate.

14. (Previously Presented) A reactor according to claim 12, wherein at least one plate includes a passageway in which a heat exchange medium can flow in a first direction and at least one plate includes a passageway in which a heat exchange medium can flow in a second direction that is opposite the first direction.

15. (Previously Presented) A reactor according to claim 12, wherein plates of substantially the same shape are juxtaposed in a stack, each plate having a particular pattern of passages etched out on a surface thereof, and wherein passages in different orientations are defined by alternate alignment of successive plates by rotation of the respective plate in the plane of the plate.

16. (Previously Presented) A reactor according to claim 12, wherein plates lacking channelled surfaces are incorporated in the heat exchanger panel to prevent intermixing of fluids.

17. (Previously Presented) A reactor according to claim 11, further comprising a chemical reaction zone bounded by at least one surface including a heat exchanger that permits heat exchange with fluids flowing through the zone to achieve a reaction, the zone and the surface at least in part being defined by a printed circuit heat exchange (PCHE) panel, the heat exchange panel defining discrete passages providing for flow of fluid reactants and a heat transfer medium, respectively,

wherein at least two different flow paths are defined in the plate for handling the heat transfer medium, and

wherein the heat transfer medium is permitted to pass in at least two differing directions through the fluid flow passages with respect to the flow of fluid reactants through the fluid flow passages.

18. (Previously Presented) A reactor according to claim 17, wherein the fluid flow passages are configured to cause heat transfer medium flowing therethrough to make more than one pass along the length of the plate.

19. (Previously Presented) A reactor according to claim 18, wherein the fluid flow passages comprise serpentine portions including a series of short, sharp turns.

20. (Previously Presented) A reactor according to claim 17, wherein the fluid flow passages comprise a zig-zag pattern imposed upon substantially the whole length of each individual passage.

21. (Previously Presented) A process for performing chemical reactions under controlled temperature conditions, the process comprising:

(a) delivering reactant fluids successively through a chemical reaction zone to achieve a reaction and through a heat exchanger that bounds the chemical reaction zone and that allows heat exchange between the reactant fluids and a heat transfer medium, the heat exchanger at least in part being defined by a printed circuit heat exchange (PCHE) panel providing (1) passages providing for flow of the heat transfer medium therein and (2) passages providing for flow of the reactant fluids therein;

(b) introducing the heat transfer medium to the PCHE panel; and

(c) causing the heat transfer medium to pass in at least two differing directions through the passages in the PCHE panel with respect to the flow of fluid reactants through the passages in the PCHE panel.

22-27. (Cancelled)

28. (Previously Presented) A reactor according to claim 12, wherein at least two differing plate designs are used to make up the panel.

29. (Previously Presented) A reactor according to claim 20, wherein the catalyst bed includes a catalyst comprising one of spherical bodies, cylindrical bodies, hollow bodies, solid particles, expanded particles, pourous solids, wire mesh coated matrix catalyst, and woven gauze coated matrix catalyst.